

# Preventive Medicine in Practice: The State of the Art

DAVID J. MARON, BA, Beverly Hills, California

*Primary and secondary prevention, as opposed to tertiary prevention, is the logical approach to attack today's leading causes of premature death. To apply preventive medicine in their practices, physicians may use a number of tools. The traditional annual examination should be abandoned in favor of periodic screening of asymptomatic patients according to age and sex. Screening should be done on a case-finding basis, facilitated by use of a longitudinal screening flow sheet and evaluated by use of a retrospective audit. An age-sex register can help identify which patients belong to a high-risk group. Health hazard appraisal is a tool for estimating a patient's risk before and after prescribed preventive intervention, and may stimulate patient risk factor reduction—as may other behavior modification techniques. In many cases these tools can be applied by paramedical personnel. Further research is needed to gauge the effects of these techniques on risk, morbidity and mortality.*

DESPITE THE increasing interest in recent years in preventive medicine, there has been a lag in development of a sound, scientific basis for its practice.<sup>1</sup> It is the purpose of this article to examine the present state of the art of preventive medicine, with particular emphasis on the role of primary care physicians and asymptomatic adult patients.

Preventive medicine may be typed as primary, secondary or tertiary.<sup>2</sup> Primary prevention is the prevention of any clinical manifestations of disease—that is, health maintenance and health promotion. Secondary prevention is the early detection and treatment of established disease in an

asymptomatic person. Tertiary prevention is the rehabilitation, palliation and avoidance of further complications in a person with symptomatic illness. Traditionally, clinical medicine has taken the form of tertiary prevention. The term preventive medicine in this article refers only to primary and secondary prevention, meaning both action taken to ward off the development of signs and symptoms of disease in people who are at risk, and action to promote health. Primary care refers to first-contact and continuing general care by a physician who assumes the role of coordinating overall patient management<sup>3</sup> and delivering comprehensive health care.<sup>4</sup>

Since the turn of the century heart disease, cancer and stroke have replaced infectious diseases as the leading causes of death. Research over the last few decades has provided us with an improved

Mr. Maron is a fourth-year medical student, class of 1981, University of Southern California School of Medicine, Los Angeles.

Reprint requests to: Mr. David J. Maron, 609 North Linden Drive, Beverly Hills, CA 90210.

understanding of the natural history of these modern diseases. It has been found that the precursors—or risk factors that predispose persons to having these problems develop—are largely linked to life-style patterns. Belloc examined seven personal health-promoting practices and found that the number observed was positively correlated with physical health status and negatively correlated with mortality.<sup>5</sup>

The United States Department of Health, Education, and Welfare published the first Surgeon General's Report on Health Promotion and Disease Prevention with the intention "to encourage a second public health revolution in the history of the United States."<sup>6</sup> It cited cigarette smoking as the "single most important preventable cause of death." Cigarette smoking is a major risk factor for cardiovascular disease, the number one cause of death, and it is responsible for approximately 80 percent of all lung cancer, the most common form of cancer in men. According to the report, alcohol is responsible for more than 10 percent of all deaths in this country. Cirrhosis is the seventh leading cause of death in the United States,<sup>7</sup> and 95 percent of deaths from this cause are alcohol related.<sup>6</sup> About 50 percent of drivers fatally injured in car accidents have been found to have elevated blood alcohol levels. An estimated 80 percent of Americans do not use lap or shoulder seat belts while driving. Occupational hazards may be associated with 20 percent of total cancer mortality. In summary, the document estimates that "as much as half of U.S. mortality in 1976 was due to unhealthy behavior or life-style."<sup>6</sup> Thus, the leading causes of premature death are preventable. It is also apparent that traditional medicine, which focuses on the diagnosis and treatment of overt disease, is not an adequate approach to reducing premature death and promoting health.

Preventive medicine is clearly indicated, and could take many alternative forms. One mode, which is the topic of this article, is the practice of preventive medicine within the individual doctor-patient relationship: the medical model. If primary care physicians are responsible for delivering comprehensive health care, then this includes the responsibility for prolonging useful life expectancy by protecting patients from diseases for which signs and symptoms have not yet appeared.<sup>4</sup>

Many other modes of primary and secondary prevention exist. The use of mass media has

proved to be an effective tool in lowering disease risk.<sup>8</sup> The use of peer leaders as the primary agents of intervention show promising short-term results in the learning of pressure-resistance skills in adolescents.<sup>9</sup> Indeed, there is a multitude of public health policies that, if implemented, could contribute greatly to preventing disease. It is beyond the scope of this paper to expose these other possibilities. Rather, this paper focuses only on certain office techniques that primary care physicians can use to apply the principles of preventive medicine.

### Periodic Health Examinations

Preventive medicine differs from traditional medicine in that physicians, and not patients, initiate the intervention.<sup>1</sup> As opposed to a symptomatic patient, an apparently healthy, asymptomatic person rarely asks for the services of a physician. In preventive medical practice, a physician is the prime mover with the application of screening procedures. Screening is defined as "the presumptive identification of unrecognized disease or defect by the application of tests, examinations, or other procedures which can be applied rapidly."<sup>10</sup> The tendency of primary care practitioners in the United States has been to carry out mass, multiphasic screening annually for each asymptomatic person older than 5 years of age, without evidence that this ritual is either effective in changing the outcome of many diseases or is an economically justifiable use of existing medical resources.<sup>11</sup>

Frame and Carlson<sup>1</sup> developed a program for primary care physicians to conduct periodic health screening of asymptomatic adults. They proposed specific screening criteria and suggested the use of a longitudinal screening flow sheet to aid identification of what examinations or tests should be done at what intervals for which asymptomatic patients. Breslow and Somers<sup>12</sup> made an effort to "construct a lifetime schedule, or series of 'packages' of effective individual preventive procedures as an alternative to the annual checkup." They divided the life span into ten periods, based on changing life-styles, health needs and problems. For each period, they formulated a set of overall health goals and professional services or requirements related to these goals. They also suggested eight criteria for the selection of a screening procedure:

(1) the procedure is appropriate to the health goals of the relevant age group (or groups) and is acceptable to

the relevant population; (2) the procedure is directed to primary or secondary prevention of a clearly identified disease or condition that has a definite effect on the length or quality of life; (3) the natural history of the disease (or diseases) associated with the condition is understood sufficiently to justify the procedure as outweighing any adverse effects of intervention; (4) for purposes of screening, the disease or condition has an asymptomatic period during which detection and treatment can substantially reduce morbidity or mortality or both; (5) acceptable methods of effective treatment are available for conditions discovered; (6) the prevalence and seriousness of the disease or condition justify the cost of intervention; (7) the procedure is relatively easy to administer, preferably by paramedical personnel with guidance and interpretation by physicians, and generally available at reasonable cost; and, (8) resources are generally available for follow-up diagnostic or therapeutic intervention if required.

The Canadian Task Force on the Periodic Health Examination was established in 1976 to evaluate the merits of traditional checkups and to make recommendations.<sup>13</sup> Its goal was to "recommend a plan for a lifetime program of periodic health assessment" to enhance or protect the health of the population. The final recommendation of the committee was that "the routine annual checkup be abandoned in favor of a selective approach that is determined by a person's age and sex." They created 18 health protection packages "to be performed at 35 specified times between conception and old age . . . appropriate to the various health needs at the different stages of human life." Their recommendations represent minimum standards for asymptomatic persons at risk. A five-year interval was arbitrarily selected as the average time between checkups for the non-pregnant adult up to the age of 74. The interval chosen was arbitrary because there is "virtually no evidence about the optimal frequency of most of the components of the packages." A two-year interval was recommended for those 75 years old or older. Furthermore, the report recommended that the periodic health packages be used for case-finding rather than screening; in other words, screening patients already visiting a doctor's office for symptomatic complaints, rather than specifically scheduling an appointment solely for screening purposes. (Exceptions to this recommendation are for prenatal care, well-child care and geriatric care.) The task force suggested that primary care physicians record a cumulative checklist of screening maneuvers to facilitate case-finding screening. Age-sex registers were recommended in order to aid community-based research about the effectiveness of periodic health examinations.

Such a register could also help to readily identify high-risk patient subgroups for whom a preventive intervention may be appropriate.

Frame<sup>11</sup> advocates the use of a retrospective performance audit to evaluate how well screening is being implemented.

Eddy<sup>14</sup> reviewed several clinical and epidemiologic studies and, applying screening criteria similar to those of Breslow and Somers, made recommendations about tests for the early detection of cancer; these recommendations have been adopted by the American Cancer Society. A cancer-related health checkup is recommended every three years for all persons over 20, and every year for all persons over 40.

Recommendations from the American Cancer Society and other sources about the use of certain screening tests in asymptomatic adults are summarized in Table 1. Most of these recommendations are based on nonrandomized or uncontrolled trials and clinical judgment,<sup>14</sup> which explains the striking variety of proposed screening schedules. Unable to await more precise data, physicians should act with the best available information—even though it is incomplete. Individual physicians should choose the protocol consistent with (1) their interpretation of the available data, (2) the individual risk factors of a patient and (3) the objectives and budget of a patient. The desire to provide the best care possible may lure a clinician into using unjustifiably frequent or inappropriate screening tests without proper consideration of associated risks, side effects, or monetary and nonmonetary costs to the patient and society. Furthermore, if the projected oversupply of physicians in this country becomes a reality, the financial incentive to provide screening tests may become an increasingly difficult barrier to the responsible practice of preventive medicine.

### Health Hazard Appraisal

In 1968 Sadusk and Robbins<sup>4</sup> introduced health hazard appraisal (HHA) as a technique for outlining a preventive medicine program in comprehensive health care by primary care physicians. HHA is based upon the fact that every person possesses certain quantifiable health hazards as a member of a sex-age-race constituted group, and that these average risks may be applied to the individual patient if the physician knows the patient's prognostic characteristics and the mortality experience of cohorts with similar prognostic characteristics. Consequently, with knowledge of

a patient's clinical, historical and life-style data, a clinician can apply risk multipliers to baseline risks to compute (1) the patient's risk of death in an ensuing ten-year period, (2) the appraisal age, which reflects the overall measure of risk and (3) the compliance age, which reflects the reduced total risk if the patient complies with a set of recommended preventive interventions. Only the leading 10 to 15 causes of death are chosen for risk estimation, and attention is paid only to those risk factors that have the greatest probability of affecting a person's health.<sup>15</sup>

HHA is the prototype upon which other risk appraisal instruments have been formed.<sup>16</sup> Implied in all methods of risk estimation is that information in addition to the typical history and physical examination must be obtained. In-depth histories are necessary, including such information as occupational hazards, cigarette and alcohol use, use of other drugs, number of miles driven per year, use of seat belts, diet patterns, level of

activity, possession of dangerous weapons and ability to manage stress. Such information can be obtained by paramedical personnel.

### Risk Factor Reduction

The usefulness of HHA is predicated on two assumptions:<sup>16</sup> (1) giving persons information about their own risk will lead to actions perceived as and directed at reducing risk and (2) given a particular disease with a known incidence and for which there are identified risk factors, then reducing risk in an individual patient will indeed lead to a lower probability that the disease will develop. In attempting to substantiate these hypotheses, it is important to update the information regarding changes in prevalence, morbidity incidence, mortality (with geographic variation) and risk reducibility, as well as to update the models for estimating risk. A few studies using HHA in conjunction with patient counseling as a tool to reduce risks have been reported.<sup>17-20</sup> These studies

TABLE 1.—A Summary of Recommendations From Different Sources About the Use of Certain Screening Procedures to Detect Different Types of Conditions in Asymptomatic Persons

Test or Procedure	Age and Frequency	Test or Procedure	Age and Frequency
<i>Pap smear</i>		<i>Breast self-examination</i>	
ACOG . . . .	Initial smear when sexually active or age 18. Repeat in six months, then annually.	F and C . .	Every month, starting at age 20.
Frame . . . .	Initial smear when sexually active or age 21. Repeat in one year, then every two years.	ACS . . . . .	Every month over age 20.
ACS . . . . .	Initial smear when sexually active or age 20. Repeat in one year, then every three years to age 65. More frequently in high-risk women.	CTF . . . . .	To be researched.
CTF . . . . .	Initial smear when sexually active. Repeat in one year, then every three years to age 35 and every five years thereafter. Annual smears in high-risk women.	<i>Breast physical examination</i>	
<i>Stool occult blood test</i>		F and C . .	Every two years between the ages 20 and 50, then annually.
Frame . . . .	Every two years between ages 40 and 50, then annually.	ACS . . . . .	Every three years between the ages 20 and 40, then annually.
ACS . . . . .	Annually over age 50.	CTF . . . . .	Annually between the ages 50 and 59.
CTF . . . . .	Not more frequently than annually over age 45.	<i>Mammography</i>	
<i>Sigmoidoscopy</i>		F and C . .	Annually or biannually only in women over 50 with large, fatty breasts.
Frame . . . .	Not routinely recommended; single procedure age 55.	ACS . . . . .	Baseline between the ages 35 and 40. Consult personal physician under age 50. Annually over age 50.
ACS . . . . .	Initial procedure over age 50, repeat in one year, then every three to five years.	CTF . . . . .	Annually between the ages 50 and 59.
CTF . . . . .	Not recommended.	<i>Chest x-ray</i>	
<i>Digital rectal examination</i>		F and C . .	Not recommended.
Frame . . . .	Not recommended.	ACS . . . . .	Not recommended.
ACS . . . . .	Annually over age 40.	CTF . . . . .	Not recommended.
CTF . . . . .	Not recommended.	B and S . .	Not recommended.
		<i>Electrocardiogram</i>	
		F and C . .	Not recommended.
		CTF . . . . .	Not recommended.
		B and S . .	Every five years over age 40.
		<i>Serum cholesterol</i>	
		F and C . .	Every four years in all adults.
		CTF . . . . .	Not recommended other than once to screen young males for hyperlipidemia.
		B and S . .	Every five years over age 40.

ACOG=American College of Obstetricians and Gynecologists<sup>11</sup>  
 ACS=American Cancer Society<sup>14</sup>  
 B and S=Breslow and Somers<sup>12</sup>

CTF=Canadian Task Force<sup>13</sup>  
 F and C=Frame and Carlson<sup>1</sup>  
 Frame<sup>11</sup>

suggest that HHA is effective in stimulating risk reduction. However, Sacks and co-workers<sup>20</sup> evaluated the reliability of the HHA questionnaire and found a high degree of inconsistency in the responses to a baseline questionnaire compared with a follow-up questionnaire. The study concluded that the reliability of the HHA questionnaire is questionable, and that the previously reported successes of HHA in stimulating risk reduction may only reflect the variation in response when a person fills out the questionnaire twice. Before this tool is adopted into widespread practice or accepted as a reliable longitudinal measure of risk, randomized controlled trials must be done to study the issue of reliability in addition to reduction in risk, morbidity and mortality.

Even if carried out according to the most thoughtful criteria, a physician does a questionable service by screening and appraising the health of a patient only to terminate the encounter with advice such as "quit smoking" or "lose weight." Such a method has a poor success rate.<sup>21</sup> Although education is a necessary step toward risk factor reduction, it alone is rarely sufficient.<sup>9</sup> How to make it most probable that a patient will indeed improve his or her life-style patterns is the most difficult challenge of preventive medicine.

The behavioral sciences supply both the theoretical framework for understanding the origins of behavior and the methods for achieving self-directed change. Bandura developed a theory of social learning which discusses the source of behavior patterns in the context of role models, antecedent determinants (stimuli) and consequent determinants (reinforcers) of personal action.<sup>22</sup> His theory provides a basis for understanding the mechanism of behavior change. Work by other behavioral scientists has led to specific techniques for achieving changes in attitude and behavior.<sup>23</sup> Examples of such techniques include setting realistic goals; showing commitment to change by signing contracts to reach these goals; enlisting emotional support from family and friends; recording in a diary the context, frequency and other features of the problem behavior; learning to talk to oneself to counter those attitudes that are barriers to adopting change, and learning to reward oneself for positive changes.

It is feasible for primary care physicians to use the principles of behavior modification in their office practices. This may be realistically achieved by using the talents of another health provider—such as a nurse, nurse practitioner, physician's

assistant or health educator—who has acquired expertise in behavior modification techniques. Unfortunately, there are few data available to evaluate the effectiveness of this approach.

## Summary

The leading causes of premature death are related to life-style and are therefore preventable. However, traditional medicine, which focuses on the diagnosis and treatment of overt disease, does not meet the challenge that these modern diseases present. Primary and secondary prevention is the logical approach to improve our country's health status. Yet the growth in interest in preventive medicine has not been accompanied by an equally strong development of a sound, scientific approach to its clinical practice.

This article has not discussed all of the various effective methods of preventive intervention, but only explores the practice of prevention within the medical model. The physicians' role within this model has been proposed by Lichtenstein and Danaher,<sup>21</sup> Robbins and Hall,<sup>15</sup> Schuman<sup>24</sup> and others.<sup>1,4</sup> A synthesis of their views is as follows: (1) act as a model of a healthy life-style, (2) detect risk using proved screening tools, (3) provide information clarifying the risk associated with the habit, and the risk reduction if the patient stops, (4) encourage life-style change by direct advice and suggestions, and by the use of behavior modification techniques whenever possible, (5) refer the patient to a specialized program if necessary, (6) prescribe and follow up the use of specific behavioral change and maintenance strategies and (7) keep track of successes and failures, and revise the strategy accordingly.

In attempting to fulfill this role physicians are faced with a difficult task. From this review it is painfully clear that virtually any preventive technique for use on asymptomatic adults is based upon incomplete data. We do not have the evidence from randomized, controlled trials that the tools described—periodic health examinations, HHA and risk factor reduction techniques—are effective in reducing risk, morbidity and mortality. Clinicians must act today based on the best available data. (Ironically, the primary care implementation of these tools may provide valuable information regarding their effectiveness.) Using presently available data, the following are practical suggestions for primary care providers of preventive medicine.

Many screening tests or procedures in wide-

spread use on asymptomatic adults should be reduced in frequency of application if not discarded. The author agrees with Hulley and associates<sup>25</sup> that "active intervention should not be pursued in the general practice of preventive medicine until there is persuasive evidence, not just that the action will do no harm, but that it will be beneficial." The desire to provide the best possible medical care, to follow "common practice," intuition or personal emotional bias, and the presence of strong financial incentives to provide screening tests, are powerful forces that run counter to scientific judgment. It is understood that different persons may quite properly elect to interpret the available information differently or to place different importance upon the expected benefits, risks and costs of intervention.<sup>14</sup> Nevertheless, thoughtful criteria for the application of screening tests have been proposed and demand recognition.

Traditional annual examinations should be abandoned in favor of periodic screening according to age and sex. Screening should be done on a case-finding basis—that is, during visits for other symptomatic complaints. Development of a longitudinal screening flow sheet for asymptomatic adults is recommended<sup>1,11,13,26</sup> as a valuable tool to check to see if screening is needed at every patient visit, and a retrospective audit can help to evaluate the implementation of a screening program.<sup>11</sup>

The development of an age-sex register may help physicians to easily identify which patients are members of a high-risk group for a specific disease, in the event that a new screening test, immunization or the like should become available.

The incorporation of major risk factors into a patient's problem-oriented medical record and problem list may help a clinician assess the overall risk for a given patient and allow for monitoring over time. However crude the instrument for assessing risk, it is necessary to elicit information in a history that might not ordinarily be considered to lie within the realm of conventional medicine. The HHA questionnaire may prove to be a valuable tool, but further research to establish it as such is necessary. The use of paramedical personnel—such as nurses, nurse practitioners, physician's assistants or health educators—should be

considered for applying preventive techniques within an office practice.

Further research is necessary to both update the tools of the medical model of preventive medicine and to evaluate the effectiveness of this model compared with other approaches to primary and secondary prevention.

#### REFERENCES

1. Frame PS, Carlson SJ: A critical review of periodic health screening using specific screening criteria. *J Fam Pract* 2:29-36: 123-129, 189-194, 283-289, 1975
2. Berg AO: Prevention in perspective: History, concepts, and issues. *J Fam Pract* 9:37-46, Jul 1979
3. Stewart MM: Primary care in the large urban hospital. In Nobel J (Ed): *Primary Care and the Practice of Medicine*. Boston, Little, Brown and Co., 1976, pp 209-227
4. Sadusk JF, Robbins LC: Proposal for health-hazard appraisal in comprehensive health care. *JAMA* 203:1108-1112, Mar 1973
5. Belloc NB: Relationship of health practices and mortality. *Prev Med* 2:67-81, Mar 1973
6. Healthy People. US Department of Health, Education, and Welfare, 1979
7. Vital Statistics Los Angeles County 1977. County of Los Angeles, Department of Health Services, 1979
8. Farquhar JW, Maccoby N, Wood PD, et al: Community education for cardiovascular health. *Lancet* 1:1192-1195, Jun 4, 1977
9. McAlister AL, Perry C, Maccoby N: Adolescent smoking: Onset and prevention. *Pediatrics* 63:650-658, Apr 1979
10. Froom J, Boisseau V, Sherman A: Selective screening for lead poisoning in an urban teaching practice. *J Fam Pract* 9: 65-70, Jul 1979
11. Frame PS: Periodic health screening in a rural private practice. *J Fam Pract* 9:57-64, Jul 1979
12. Breslow L, Somers AR: The lifetime health-monitoring program—A practical approach to preventive medicine. *N Engl J Med* 296:601-608, Mar 17, 1977
13. The Task Force on the Periodic Health Examination: Periodic (vs. annual) health examination. *Can Med Assoc J* 121: 1-45, Nov 3, 1979
14. Eddy D: Guidelines for the cancer-related checkup—Recommendations and rationale. *CA* 30:194-240, Jul-Aug 1980
15. Robbins LC, Hall JH: Prospective medicine. In Rakel RE (Ed): *Family Practice*, 2nd Ed. Philadelphia, WB Saunders, 1978, pp 160-174
16. Goetz AA, Duff JF, Bernstein JE: Health risk appraisal: The estimation of risk. In National Conference on Health Promotion—Programs in Occupational Settings, State-of-the-Art Papers. Office of Health Information and Health Promotion, Office of the Assistant Secretary for Health, US Department of Health, Education, and Welfare, Jan 1979
17. LaDou J, Sherwood JN, Hughes L: Health hazard appraisal in patient counseling. *West J Med* 122:177-180, Feb 1975
18. LaDou J, Sherwood JN, Hughes L: Health hazard appraisal counseling—Continuing evaluation. *West J Med* 130:280-285, Mar 1979
19. Rodnick JE, Bubb K: Patient education and multiphasic screening: It can change behavior. *J Fam Pract* 6:599-607, 1978
20. Sacks JJ, Krushat WM, Newman J: Reliability of health hazard appraisal. *Am J Public Health* 70:730-732, Jul 1980
21. Lichtenstein E, Danaher BG: What can the physician do to assist the patient to stop smoking? In Brashear RE, Rhodes ML (Eds): *Chronic Obstructive Lung Disease: Clinical Treatment and Management*. St. Louis, CV Mosby, 1978, pp 227-241
22. Bandura A: *Social Learning Theory*. Englewood Cliffs, NJ, Prentice Hall, 1977
23. Farquhar JW: *The American Way of Life Need Not be Hazardous to Your Health*. New York, WW Norton and Co, 1978
24. Schuman SH: Prevention: The vital and unique role of the family physician. *J Fam Pract* 9:97-102, Jul 1979
25. Hulley SB, Rosenman RH, Bawol RD, et al: Epidemiology as a guide to clinical decisions—The association between triglyceride and coronary heart disease. *N Engl J Med* 302:1383-1389, Jun 19, 1980
26. Sloane P: A prevention oriented medical record. *J Fam Pract* 9:89-96, Jul 1979